A. Adjusted vs. Unadjusted Betas

In our initial report, Brattle relied on the CAPM and an empirical version, the Empirical Capital Asset Pricing Model ("ECAPM"), to obtain its estimate of the cost of capital for the cable service industry.[8] The CAPM expresses the cost of equity as the sum of the risk-free rate and a risk premium,

$$r_E = r_f + \beta(r_M - r_f) \qquad (1)$$

where r_E is the return on equity, r_f is the risk-free rate, r_M is the return on the market and β is the equity beta, a measure of risk.

Brattle obtains its estimates of beta by regressing the excess of the equity returns over the risk-free rate, $r_E - r_f$, on the excess of the return on the market less the risk-free rate, $r_M - r_f$. Brattle obtains an average estimate of 1.82 at the observed capital structures for its sample of publicly traded cable companies. At paragraph 9 of his affidavit, Dr. Vander Weide claims that Brattle betas are overestimates of the true betas because Brattle does not adjust its betas "for the well-documented tendency of betas to move toward the mean beta of 1.0." Dr. Vander Weide adjusts the 1.82 to an estimate of 1.54 by weighting it with 1.0 in the following way[9]:

$$1.54 = (.66)(1.82) + (.34)(1.0) \qquad (2)$$

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[8] In its July 1994 paper, Brattle first demonstrated that the CAPM and ECAPM provide cost of equity estimates which are comparable to those provided by the DCF methodology. We then explained why it was inappropriate to rely on the DCF directly for an industry such as cable where firms typically pay no dividends.

[9] Vander Weide Affidavit at footnote 4.

1. Empirical Evidence

We address the theoretical foundations of Dr. Vander Weide's beta regression argument below. First, however, we note that the empirical evidence does not support Dr. Vander Weide's claim that the betas for this industry are exhibiting the tendency to regress towards one. For convenience, the equity betas we obtained in our July 1994 Report have been included here, see Tables 1 and 2.[10] Table 1 presents the equity betas for cable service companies at their observed capital structures from 1987 to 1994. Table 2 presents the cable equity betas, all adjusted to the same hypothetical capital structure of 50 percent debt and 50 percent equity.

Examination of the equity betas in Tables 1 and 2 would not lead one to conclude that the betas are regressing towards 1.0. The equity betas in Table 1 are all generally increasing, digressing from 1.0 instead of towards it. Similarly, the equity betas in Table 2 do not display a tendency to regress towards 1.0. If anything, they are also moving away from 1.0. Note that the betas in Table 2 are all measured at the same capital structures, so any trends due to changes in capital structure that might conceivably be reflected in Table 1 have been removed.

Empirically, Dr. Vander Weide supports his claim that Brattle betas need to be adjusted by arguing that cable industry-specific events unrelated to general market movements have affected the measurement of beta. He claims that by simply removing return observations corresponding to specific events in the cable industry results in a lower beta estimate.

Our use of five years of monthly data to estimate betas already minimizes the impact of industry-specific shocks to some degree.[11] Moreover, the underlying theory of beta is that it measures the response to economy-wide events, with company- or industry-specific events

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[10] See Brattle's July 1994 Report, Tables 9 and 10, pp. 41-42.

[11] At paragraph 11 of his affidavit, Dr. Vander Weide indicates that he re-estimated the cable betas using weekly data. He does not state what estimates he obtains, so it is difficult to assess what beta estimate is associated with the 28 basis point reduction he identifies.

Table 1

Equity Betas for Cable Service Companies

	1987	1988	1989	1990	1991	1992	1993	1994
Adelphia	NA	NA	NA	NA	1.58	1.80	2.15	2.37
Cablevision	NA	NA	NA	NA	1.52	1.75	1.91	1.99
Century	NA	NA	NA	NA	1.90	2.09	2.35	2.31
Comcast A	0.93	1.04	1.08	1.26	1.21	1.52	1.63	1.55
Comcast Special	NA	NA	NA	NA	1.25	1.63	1.70	1.64
Jones Intercable	1.34	1.40	1.47	1.38	1.26	1.38	1.67	1.69
Jones Intercable A	1.69	1.83	1.75	1.65	1.56	1.82	2.05	1.91
Jones Spacelink	1.55	1.47	2.09	2.32	2.15	2.36	2.26	2.34
TCA Cable	0.85	0.89	0.88	0.99	0.85	0.89	0.92	0.89
Tele-Comm. A	1.20	1.33	1.31	1.48	1.40	1.68	1.78	1.79
Tele-Comm. B	1.04	1.15	1.16	1.34	1.23	1.33	1.48	1.49
Avg. Cable TV	1.23	1.30	1.39	1.49	1.45	1.66	1.81	1.82

Source: The Brattle Group.

Note: Betas are estimated using Compuserve stock price data for the 60 months prior to and including December of that year except for 1994, which is estimated for the 60 months prior to and including April 1994.

Table 2

Equity Betas of Cable Service Companies Adjusted to Hypothetical 50% Debt-to-Value Capital Structure

	1987	1988	1989	1990	1991	1992	1993	1994
Adelphia	NA	NA	NA	NA	1.06	1.07	1.13	1.20
Cablevision	NA	NA	NA	NA	1.27	1.32	1.44	1.48
Century	NA	NA	NA	NA	1.95	2.00	2.19	2.16
Comcast A	1.33	1.28	1.28	1.41	1.36	1.51	1.73	1.66
Comcast Special	NA	NA	NA	NA	1.40	1.60	1.80	1.74
Jones Intercable	1.41	1.48	1.50	1.31	1.21	1.27	1.47	1.49
Jones Intercable A	1.70	1.85	1.73	1.51	1.42	1.56	1.73	1.63
Jones Spacelink	1.48	1.39	1.72	1.65	1.49	1.42	1.34	1.38
TCA Cable	1.31	1.39	1.32	1.44	1.24	1.28	1.31	1.27
Tele-Comm. A	1.25	1.38	1.37	1.47	1.41	1.66	1.82	1.83
Tele-Comm. B	1.13	1.22	1.24	1.35	1.27	1.37	1.56	1.57
Avg. Cable TV	1.37	1.43	1.45	1.45	1.37	1.46	1.59	1.58

Source: The Brattle Group.

Note: Betas are estimated using Compuserve stock price data for the 60 months prior to and including December of that year except for 1994, which is estimated for the 60 months prior to and including April 1994.

canceling each other out. Dr. Vander Weide could be right only if a remarkable coincidence had occurred, in which each piece of unique news happened to have corresponded to a market-wide movement in the same direction, thereby magnifying the estimated beta.

We test for this coincidence below. However, we first note that it is virtually always possible to "cherry pick" events that will have the effect of increasing or decreasing a given beta. That proves nothing. Only if a blind elimination of *all* special events leads to a material change in beta has a coincidence of the sort Dr. Vander Weide alleges actually occurred.

In fact, Dr. Vander Weide has been very selective in the industry-specific events he identifies. Dr. Vander Weide has singled out only three events over the last five years of cable history. These are the TCI-Bell Atlantic merger in October 1993 and the April 1, 1993 and March 30, 1994 reduction in cable rates announcements. There are other industry-specific events not identified by Dr. Vander Weide which have affected cable stock returns. Consider for example, the Crown Media/Cencom deal in September 1991, or October 1992, when the cable bill became law.

Brattle identified at least seven other industry-specific events that seem to meet Dr. Vander Weide's criteria. Depending on one's definition of an "event", an additional four events also may meet these criteria.[12] We re-estimated the betas eliminating the seven monthly observations associated with the events and obtained a beta estimate of 1.79. An estimate of 1.76 was obtained when the eleven monthly observations were eliminated. These

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[12] The seven events are March 1990, the Senate issued a new version of the proposed cable legislation; June 1991, FCC voted to reinstate local rate regulation for cable TV operators; September 1991, Crown Media/Cencom deal announced; October 1992, cable bill became law; April 1993, FCC released cable rate regulation rules; October 1993, TCI-Bell Atlantic merger; and April 1994, release of the FCC's Cost-of-Service Order. The additional four events are January 1990, the FCC opened inquiries into possible cable competition; January 1991, cable rate regulation bill, S-12, was introduced in the Senate; February 1992, Senate passed cable rate regulation bill S-12 restoring cable rate regulation; and July 1992, House of Representatives passed cable rate regulation bill.

estimates are only slightly (and not significantly) lower than the 1.82 estimate obtained using all sixty months of data.

We would urge the Commission to be suspicious of any methodology that relies on eliminating data based on subjective judgments of what events in this industry are atypical or aberrational. The actual, objective reality facing the cable industry is a situation of rapid technological, regulatory and market changes. This reality shows no sign of abating within the foreseeable future. The normal circumstances of this industry -- which investors assess in making investment decisions -- include periodic "aberrational" events, and the Commission's cost of capital analysis should not arbitrarily disregard these events.

In these circumstances, if the Commission believes that "aberrational" events should be excluded, it is critical to use an objective approach to decide what events are "aberrational." As a second way to provide such a check, for each observation in our beta calculations we calculated the residual of the actual return over the predicted return based on the beta regression.[13] This residual was standardized by dividing by the standard error of the residuals of the 60-month time-series. The resulting standardized residual is similar in construction to a t-statistic.

The standardized residual exceeded 2.0 for only two months, September 1991 (the Crown Media/Cencom deal) and October 1993 (the announcement of the TCI-Bell Atlantic merger).[14] A beta estimate of 1.83 was obtained by eliminating these two months from the regression, slightly *higher* than the 1.82 obtained for the full 60-months. We also considered a regression where we eliminated all observations corresponding to standardized residuals exceeding 1.0. There were 14 of these observations. For each of these months some

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[13] To facilitate this approach we created a portfolio of the cable stock returns. The portfolio was constructed as the simple average of the returns for each cable stock considered in our analysis. The beta of this portfolio on the S&P 500 was 1.82. This is identical to the average of the betas for the individual stocks.

[14] Standardized residuals exceeding 2.0 are approximately greater than two standard errors from the mean.

arguably significant industry-specific event could be identified. A beta estimate of 1.84 for the cable industry was obtained when these 14 months were eliminated from the regression.

Contrary to Dr. Vander Weide's claim, therefore, when *all* relevant cable industry-specific events are considered, cable industry betas are robust to the removal of dates corresponding to industry-specific events.

2. Theoretical Evidence

Dr. Vander Weide states at page 6 of his affidavit that the need to adjust for a general tendency of betas to regress to 1.0 arises because Brattle's beta estimates are estimated with a positive measurement error in this period. Thus, he claims, in order to obtain an unbiased estimate of the equity beta in the future, where the expected measurement error is zero, the beta needs to be adjusted towards 1.0. He cites an article by Professor Marshall E. Blume to support his claim.[15] However, in this article, Professor Blume actually concludes that the explanation relied on by Dr. Vander Weide is not of "overwhelming importance"[16] in explaining the regression tendency.

The academic literature in this area provides two explanations to justify the need to adjust betas. Professor Blume argues that the tendency of beta coefficients to regress towards 1.0 is explained more by real non-stationarities in the underlying betas, as opposed to the explanation offered above by Dr. Vander Weide. Others justify the need to adjust betas for Bayesian reasons.[17] However, neither of these explanations state unequivocally that betas should be adjusted to 1.0.

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[15] M.E. Blume, "Betas and Their Regression Tendencies", *The Journal of Finance*, June 1975, pp. 785-795.

[16] *Ibid.*, pg. 794.

[17] See for example Oldrich A. Vasicek, " A Note on Using Cross-Sectional Information in Bayesian Estimation of Security Betas," *Journal of Finance*, December 1973, 1233-39.

The non-stationarity explanation claims that companies of extreme high or low risk, will tend to have less extreme risk characteristics over time. Professor Blume's conclusions were based on an analysis of portfolios of companies. He observed that betas of portfolios with extremely high (low) betas in one seven year period, (that is, high or low relative to 1.0), were lower (higher) in the subsequent seven year period. Although one can speculate on plausible reasons for the change in risk, no one knows exactly how betas change over time. Unexpected changes in the industry, such as increased competition or new government regulations, may actually cause the true firm beta to increase and move away from 1.0.

The cable service industry certainly fits this description. Competition is increasing in the cable industry, as Dr. Vander Weide's own statements about telecommunications companies' plans demonstrate. Increased competition increases business risk. Increased business risk will increase the firm's true beta. Brattle provided evidence in its July 1994 Report from regressions on more recent data which suggests that cable betas are, if anything, increasing, not trending toward 1.0.[18] We also updated our analysis and estimated cable betas using data through October 1994. We obtained an estimate of 1.91. This estimate and the beta estimates in Tables 1 and 2 also support this claim.

The Bayesian explanation claims that better estimates of beta can be obtained by using information available prior to the estimation together with the actual estimate of beta. That is, if *a priori* one believes the beta of Industry X is 1.4, adjusting an estimated beta for Firm Y in Industry X toward 1.4 is an appropriate use of prior information. The adjustment that Dr. Vander Weide makes assumes that the market's *a priori* belief about the beta of the cable industry is that it is 1.0; the same as the beta of the market. He attempts to justify this by the results obtained by Professor Blume.

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[18] See Brattle's July 1994 Report, Table 12, pg. 49.

Sharpe and Alexander,[19] cited by Dr. Vander Weide as the source for the adjustment formula and for further information on the adjustment,[20] state, however, that some industries will tend to have higher betas than beta values in other industries and this prior information is better used to update beta estimates.

> "Information of the type shown in Table 15.5 can be used to "adjust" historical beta values. For example, the knowledge that a corporation is in the air transport industry suggests that a reasonable estimate of the beta value of its stock is 1.8. Thus, it makes more sense to adjust its historical beta toward a value of 1.8 than to 1.0, the average for all stocks, as was suggested in equation (15.9)."[21]

In the case of the cable industry, there is no *a priori* reason to believe the beta is one; rather, both the available evidence and logic strongly suggest that cable companies are riskier than the market and will continue to be riskier than the market over the foreseeable future. The historic betas shown in Tables 1 and 2 and discussed above, as well as cable companies' high market-to-book ratios, all suggest these companies are volatile. Hence, *a priori* the only rational view is that cable betas are greater than one. Thus, the adjustment Dr. Vander Weide recommends is incorrect for the cable industry.

B. Debt Betas

At paragraph 16 of his affidavit, Dr. Vander Weide claims that Brattle incorrectly unlevers and relevers the cable companies' betas to obtain the risk positioning cost of equity estimate

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[19] William F. Sharpe and Gordon J. Alexander, 1990, *Investments*, (4th ed.), Englewood Cliffs, NJ: Prentice Hall, pp. 427-428.

[20] Vander Weide Affidavit at pg. 6, footnote 4.

[21] *Op. Cit.* at pp. 430-431. Equation 15.9 is the weighting scheme adopted by Dr. Vander Weide as illustrated in Equation (2) of this reply statement.

for cable companies at a 50-50 capital structure. Specifically, Dr. Vander Weide claims that "Brattle errs by arbitrarily assuming a debt beta of 0.45 for cable companies."[22]

Brattle's choice of 0.45 for a cable debt beta at the observed capital structures was not arbitrary. Brattle validated the choice of the 0.45 beta in footnote 15 of Brattle's July 1994 Report. We will review the analysis Brattle performed to obtain the debt betas here for convenience and provide additional evidence that debt betas are positive for the sample of companies in our report.

One method of calculating the betas associated with debt securities relies on the CAPM formula given above in Equation (1). Equation (1) holds not only for equity securities, but also for debt securities. Therefore, if one knows the market return on debt (r_D), the risk-free rate (r_f) and the market risk premium ($r_M - r_f$), one can back out the implied debt beta (β_D). That is, if

$$r_D = r_f + \beta_D(r_M - r_f) \quad , \tag{3}$$

then,

$$\beta_D = \frac{r_D - r_f}{(r_M - r_f)} \quad . \tag{4}$$

We calculated the implied beta based on yields from the April 1994 S&P Bond Guide and Brattle's estimates of the risk-free rate and the market risk premium, 5.0 percent and 8.5 percent respectively. Table 3 shows the resulting implied debt betas.

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[22] Vander Weide Affidavit at pg.10, footnote 9.

TABLE 3 IMPLIED DEBT BETAS			
Bond Rating	***S&P Industrial Bond Yield (%)***	***Risk-Free Rate (%)***	***Implied Debt Beta***
AAA	7.79	5.0	.33
AA	7.92	5.0	.34
A	8.50	5.0	.41
BBB	8.57	5.0	.42
BB	9.54	5.0	.53
B	10.62	5.0	.66

The S&P bond rating for most of the cable companies in our sample is a "B" rating. These are highly risky bonds. The results from the table suggest that the implied beta for bonds with this rating may be as high as 0.65. Similarly, the yield on AAA and AA rated bonds suggest a beta that may be as high as 0.34 for "high grade" corporate debt.

The regression procedure we used to estimate equity betas can also be used to estimate debt betas. As a check on the reasonableness of the results obtained in Table 3, we regressed sixty months of returns on long-term high-grade corporate debt net of the return on one-month Treasuries on the excess of the return on the S&P 500 less the return on one-month Treasuries.[23] We estimated the beta for every year for which data were available, 1974 to 1993. The results are presented in Table 4. These data support the 0.25 implied debt beta obtained above for high-grade corporate debt and provide comfort that the methodology provides reasonable estimates of the debt betas.[24]

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[23] The data were obtained from Ibbotson Associates. We were unable to run similar regressions on lower grade corporate debt because data were not available for lower grade corporate debt.

[24] The low values in 1987-1991 are due to a single observation, October 1987, when the stock market crashed and capital fled to relatively secure forms of debt.

Table 4

"High Grade" Corporate Debt Betas

Year	Beta	T-Statistic
1974	0.28	4.90
1975	0.26	4.33
1976	0.25	4.71
1977	0.25	4.71
1978	0.28	5.99
1979	0.29	5.02
1980	0.19	1.99
1981	0.31	2.71
1982	0.37	3.26
1983	0.45	3.67
1984	0.38	2.96
1985	0.55	4.91
1986	0.37	4.25
1987	0.13	1.66
1988	0.12	1.65
1989	0.11	1.81
1990	0.12	2.26
1991	0.10	2.02
1992	0.28	5.49
1993	0.23	4.86

Source: The Brattle Group.

Note: Betas are estimated for the 60 months prior to and including December of each year. Long-Term Corporate Total Returns less 30-Day T-Bill Total Returns were regressed on S&P 500 Total Returns less the 30-Day T-Bill Total Returns. All data series are from Ibbotson Associates.

Although we were unable to run similar regressions on lower grade corporate debt due to data limitations, other researchers have. In their 1991 paper on the performance of low-grade bond funds, Cornell and Green concluded that the beta for low-grade bonds is 0.52.[25] They also concluded that the beta for high-grade bonds is 0.25. These results are consistent with our findings.

Dr. Vander Weide states that it is "standard practice" to assume that the beta of debt is zero.[26] If so, that practice is based on a false assumption. A debt beta of zero assumes that debt is riskless, *i.e.* it has no non-diversifiable or "market" risk. This is wrong for two reasons. First, even default-risk free debt may respond to forces such as inflation rate changes, which also affect the returns on other investments.[27] Second, for debt with default risk, default is more likely to occur in recessions when the entire market is doing poorly.[28] Theory and evidence both confirm that risky debt will have a positive beta.

We used a beta value of 0.45 for cable debt, a value that is amply justified by both theory and evidence. Dr. Vander Weide's alleged "standard practice" may be an unimportant simplification in some contexts, but here would constitute a clear and material error.

C. Overall Cost of Capital vs. Traditional Regulatory WACC

Dr. Vander Weide's criticisms of Brattle's use of the market cost of debt and market capital structure are part in parcel to his general claim that Brattle's methodology is inconsistent with the Commission's traditional procedures. Traditionally, the regulatory weighted average

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[25] Bradford Cornell and Kevin Green, "The Investment Performance of Low-Grade Bond Funds," *Journal of Finance*, March 1991, pp. 29-47.

[26] Vander Weide Affidavit at pg. 10, footnote 9.

[27] Thus, increased inflation rates empirically are bad news for the stock market as well as bonds.

[28] See Richard A. Brealey and Stewart C. Myers, 1991, *Principles of Corporate Finance* (4th ed.), New York: McGraw-Hill, Inc., pg. 579. "In general, risky bonds do have market risk (that is, positive betas) because default is more likely to occur in recessions when all businesses are doing poorly."

cost of capital ("WACC") is calculated as the weighted average of the after-tax cost of equity and the embedded cost of debt, where the weights are book weights. Brattle's method calculates the all-equity cost of capital based on market parameters and explains that the regulatory WACC at the hypothetical capital structure is also equal to this value. Brattle's method eliminates arguments over the cost of debt and the capital structure.

In this section, we nonetheless counter Dr. Vander Weide's specific claims that Brattle should have used the embedded cost of debt and book capital structure to calculate the all-equity cost of capital. We then show that the traditional regulatory WACC estimate based on the cost of equity embedded in Brattle's all-equity cost of capital is consistent with our recommendation of at least 13 percent.

1. Cost of Debt

a. Brattle's Choice of the Cost of Debt is Correct

At paragraphs 12 and 13 of his affidavit, Dr. Vander Weide criticizes Brattle for using the current (current as of the time of the analysis) S&P yield on bonds of similar rating to determine the cost of debt for use in our unlevering procedure. He states that this procedure "is inconsistent with the Commission's practice of using the embedded cost of debt to calculate the telephone companies' average cost of capital."

Our use of the current S&P bond yield to calculate the cost of capital is in accord with accepted financial theory. It is well understood that the cost of capital is a market concept, thus the cost of equity and cost of debt used as inputs into this calculation need to be market returns. Even more, the cost of equity and cost of debt are to be measured as marginal costs. In their leading graduate finance textbook, Copeland and Weston are adamant about this point:

"Although we use the term "weighted average cost of capital" to mean the cost of a mixture of sources of funds, it is important to emphasize that the costs of these funds must be measured as *marginal* costs. In this context, the word "marginal" has two meanings. Foremost is that marginal cost means the cost of new financing at current market equilibrium rates of return -- not historical cost."[29]

Dr. Vander Weide recommends use of the embedded cost of debt instead of the market based concept used by Brattle. The embedded cost of debt is calculated as interest expense divided by the book value of debt. This is an average historical cost, not a marginal market cost. The S&P bond yield, on the other hand, is a marginal market cost.

Nonetheless, the Commission may wish to perform what Dr. Vander Weide says is its traditional calculation. We now show that if done correctly, that calculation supports our findings.

b. Dr. Vander Weide's Average Embedded Cost of Debt Calculation is Downward Biased

Theoretical objections aside, Dr. Vander Weide's calculation of the average embedded cost of debt is incorrect, or at the very least misleading. Although Dr. Vander Weide characterizes his 8.31 percent embedded cost of debt as an "average" in the text of his affidavit,[30] it is not a simple average. Dr. Vander Weide uses a weighted average of the individual firms' embedded cost of debt, instead of a simple average to estimate the

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[29] Thomas E. Copeland and J. Fred Weston, 1983, *Financial Theory and Corporate Policy* (2nd ed.), Reading: Addison-Wesley Publishing Company, pp. 462-463.

[30] See Vander Weide Affidavit at ¶ 13. We do acknowledge that in Schedule 1, of his affidavit, Dr. Vander Weide labels the 8.31 percent as a weighted average, however, he does not characterize it this way in the text of his affidavit.

embedded cost of debt from his data.[31] Most cable companies are smaller and financially weaker than those in our sample, implying that even a simple average understates their cost of debt. To use a weighted average is to impute to the industry as a whole the financial strength of its biggest members. Dr. Vander Weide's technique thus biases downward his estimate of the embedded cost of debt and the overall rate of return. The simple average of the embedded costs of debt in Schedule 1 of the Affidavit of James H. Vander Weide filed August 1, 1994 is 9.2 percent, almost a full percentage point *higher* than the weighted average of 8.31 percent.

Moreover, Dr. Vander Weide has included data for the Jones Intercable Limited Partnership in his calculation of the embedded cost of debt. It is not clear why Dr. Vander Weide decided to include this company in his sample of companies from which to obtain the average embedded cost of debt. The Jones Intercable Limited Partnership is not included in the sample of pure play cable companies considered by Brattle. Nor is it one of the six companies Dr. Vander Weide used in his August 1993 Affidavit to estimate the cost of capital for the cable industry.[32] Yet, its embedded interest rate turns out to be highly misleading for readily ascertainable reasons.

Jones Intercable Limited Partnership debt is a line of revolving credit scheduled to expire in December 1994. The limited partnership has strict borrowing policies at short-term rates. The amount of borrowing is limited to 25 percent of the Partnership's assets at the time of borrowing. Interest on the outstanding balance of this line of credit is at the Partnership's

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[31] Dr. Vander Weide actually calculates the embedded cost of debt for his sample of companies by taking the total interest, summed over all companies, divided by the total book debt, also summed over all companies. This is equivalent to the weighted average of the embedded costs of debt of each company.

[32] See James H. Vander Weide Affidavit filed as an attachment to Bell Atlantic et al. Comments on August 23, 1993, at ¶ 10. The group of six cable operators for which he obtained financial data were Adelphia communications, Cablevision Industries, Cablevision Systems, Comcast Corporation, Continental Cablevision, and Tele-Communications, Inc.

option of the prime rate plus .25 percent, the CD rate plus 1.25 percent or the Euro-rate plus 1.25 percent.[33]

The embedded cost of debt for this company in 1993 is 5.14 percent. The embedded cost of debt for Jones Intercable Investors Limited Partnership in 1992 was 16.91 percent.[34] Clearly, neither the 5.14 percent in 1993 nor the 16.91 percent are representative of the average embedded cost of debt for this company. There is a mis-match between the reporting of the outstanding balance on a particular date and the interest paid over a period ending on that date. More careful review of the data would, no doubt, have led Dr. Vander Weide to realize that this was a "bad" observation that should not have been pulled in to the sample.

The simple average embedded cost of debt excluding the Jones Intercable Limited Partnership is 9.7%, very close to the average market cost of debt of 10.1%. Thus, when simple averages are compared to simple averages, Dr. Vander Weide's explanation of why the embedded cost of debt is less than the S&P bond yield is hard to believe. At paragraph 13 of his affidavit, Dr. Vander Weide states, "The cable companies' average embedded cost of debt is less than the current S&P long-term bond yield for their rating category because cable companies have relied heavily on short- and intermediate-term debt to finance their operations, while the S&P bond yield pertains only to long-term debt."

The empirical fact that the embedded cost of debt is close to the S&P bond yield is consistent with the debt maturity information contained in the cable companies' annual reports. Inspection of the debt maturities indicates that the average maturity is at least nine years, far greater than the five-year maturity usually associated with intermediate-term debt.[35] Debt of this maturity is often characterized as long-term debt. However, one might argue that

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[33] Jones Intercable Investors, L.P. 1993 Annual Report.

[34] The Jones Intercable Limited Partnership 1993 annual report shows the interest expense was $3,139,339, and the debt obligations, including capital leases, was $18,570,003.

[35] See Ibbotson Associates, 1994, *Stocks Bonds Bills and Inflation 1993 Yearbook*, pg. 5.

since the maturity is less than 20 years, the S&P yield still overstates the yield on cable debt. In section (3) below we re-estimate the cost of capital for the cable industry using the S&P yield less a maturity premium to account for the shorter maturity of cable debt. The maturity premium is the difference between the maturity premium for long-term debt of approximately 20 years and that of intermediate-term debt of approximately five years.[36]

2. Market Value vs. Book Value Weights

In a similar vein, at paragraph 14 of his affidavit, Dr. Vander Weide criticizes Brattle's use of market value weights instead of book value weights to calculate the overall cost of capital for the cable industry. Again, this is text book material: the weights to be used in the calculations are market value weights, not book values.[37] Although the market value of debt is often similar to the book value of debt, the market value of equity and book value of equity differ, often substantially. The use of book value weights is particularly problematic for the cable companies. Half of the cable companies in our sample had negative net worth.[38] The calculations proposed by Dr. Vander Weide are meaningless in this situation.

3. Overall Cost of Capital Recommendation of at Least 13.0 Percent is Consistent with Traditional Regulatory WACC Calculation

To calculate the regulatory WACC in the traditional manner Brattle needs to perform the following steps, (1) back out the cost of equity at the hypothetical capital structure embedded in the overall cost of capital estimate; (2) estimate the average embedded cost of debt; and (3) weight the resulting cost of equity and embedded cost of debt by the book capital structures.

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[36] Based on data from Ibbotson Associates, the maturity premium of long-term government debt over one-month Treasuries is about 1.5 percent. The maturity premium of intermediate-term government bonds over one-month Treasuries is approximately 1.0 percent. The difference, 0.5 percent, is the amount we subtract from the S&P bond yield to test the sensitivity of our results.

[37] See Brealey and Myers, *op. cit.* at pg. 190, and Copeland and Weston, *op. cit.* at pg. 465.

[38] See Brattle's July 1994 Report at pg. 38.

The first step is the most complex of the three. In our July 1994 report, we relied on the following formula to calculate the all-equity cost of capital, r_A,

$$r_A = r_E \left(\frac{E}{V}\right) + r_D \left(\frac{D}{V}\right) \quad , \tag{5}$$

where E is the market value of equity, D is the market value of Debt and V is the market value of the firm and r_E and r_D are defined as before. Since the overall cost of capital is assumed constant in our analysis, to determine the cost of equity at the hypothetical 50/50 capital structure all we need to know is the cost of debt, $\hat{r}_D$, associated with the new capital structure. Then we can solve for the cost of equity at the new capital structure, $\hat{r}_E$, via the following formula, which follows directly from Equation (5) above.

$$\hat{r}_E = r_A \left(1 + \frac{\hat{D}}{E}\right) - r_D \left(\frac{\hat{D}}{E}\right) \quad . \tag{6}$$

We have considered two possible scenarios for the cost of debt. One scenario assumes that at the new capital structure the cable companies will on average have a BB rating, instead of the B rating most companies in our sample have at their current capital structure. Another scenario assumes that they will have on average a BBB rating. The cost of debt is the S&P bond yield associated with these ratings.[39] To allow for the possibility of holding debt with short- to intermediate-term maturity we consider a scenario where the debt ratings are reduced by 50 basis points.[40]

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[39] To keep our estimates contemporaneous with the estimates provided in our July 1994 Report, we have relied on the same source documents for estimates of the yields.

[40] See footnote 36 above.

The average embedded cost of debt for our sample of companies is 9.7 percent. This is consistent with Dr. Vander Weide's own data provided in Schedule 1 of his report. Finally, for this calculation, at the 50/50 hypothetical capital structure the market value is assumed equal to the book value.

The results of our calculation are presented in Table 5.

TABLE 5
TRADITIONAL REGULATORY WACC ESTIMATES
AT HYPOTHETICAL 50/50 CAPITAL STRUCTURE*
(BRATTLE INPUTS)
(%)

	BB Rating		**BBB Rating at 50/50**	
Cost of Debt	***Cost of Equity***	***Regulatory WACC***	***Cost of Equity***	***Regulatory WACC***
Long-Term	17.6 / 16.6	13.6 / 13.1	18.6 / 17.6	14.1 / 13.6
Shorter-Term	17.5 / 16.5	13.6 / 13.1	18.5 / 17.4	14.1 / 13.6

* CAPM Estimates / ECAPM Estimates

The estimates in Table 5 support our claim that the methodology followed by Brattle provides the same results for the WACC as the traditional method. If anything, our estimate is conservative. The regulatory WACC estimate of 13.1 percent obtained under the BB rating scenario and ECAPM formula is virtually identical to the overall cost of capital obtained for the cable companies using the ECAPM formula in Brattle's July 1994 Report. The results for the BBB rating scenario are generally higher. Financing with shorter-term debt has negligible impact on the estimates.

D. Dr. Vander Weide Erroneously Faults Brattle for Assuming the Cost of Capital is Constant, *i.e.* Independent of Capital Structure

At paragraph 15 of his affidavit, Dr. Vander Weide faults Brattle for assuming that the cost of capital is independent of capital structure. Dr. Vander Weide asserts that it is conventional wisdom that the average cost of capital varies with a company's capital structure.[41] Presumably Dr. Vander Weide is aware that two Nobel prizes in economics have been awarded in part for exploring this "conventional wisdom" in rather more detail, yielding the results on which we rely.[42]

Brattle addressed this topic at length in its July 1994 Report. We will spare the Commission a lengthy repetition of that discussion and refer them to the section in our report on this topic.[43] In short, theoretically, the relationship between capital structure and the overall cost of capital is probably U-shaped. In practice, however, the cost of capital is not sensitive to the debt ratio within a reasonable range. Moreover, alternative methods of relevering and levering that can actually be implemented, yield relationships between the overall cost of capital and capital structure that are subject to other objections. Therefore, while theory states that this relationship does not hold everywhere, the assumption of a constant cost of capital relationship is practical to implement and plausible.

We are surprised that Dr. Vander Weide even argues about this assumption: it is inconsistent with his agreement with the beta levering formulas Brattle employed. At paragraph 16 of his affidavit, Dr. Vander Weide states "Brattle correctly reports the formulas for making the beta adjustment in their paper,..." But the beta levering formula we

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[41] Vander Weide Affidavit at ¶ 15.

[42] Franco Modigliani was awarded the Nobel prize in 1985 in part for his work with Merton Miller on the Modigliani-Miller theorems, which explore the relation between firms' capital structure and their market value. Miller was awarded the Nobel Prize for his capital structure work in 1990.

[43] See Brattle's July 1994 Report, pp. 18-22.

employed itself assumes that the cost of capital is independent of capital structure. That this is a reasonable empirical procedure Dr. Vander Weide himself apparently recognizes.

Dr. Vander Weide appears comfortable calculating the CAPM estimate of the cost of equity at a 50/50 capital structure by (1) adjusting the measured equity beta to the equity beta at a 50/50 capital structure via the levering formulas relied on by Brattle, and (2) using the adjusted beta in the CAPM formula to obtain the cost of equity at a 50/50 capital structure. Indeed, Dr. Vander Weide rightly states that this is the "correct method".[44] But, as long as the inputs are consistent, this method gives an identical answer to the method employed by Brattle, which assumes that the cost of capital is independent of capital structure. Input consistency means that the costs of equity and debt used in the formulas must be internally consistent with the underlying beta assumptions.

To show that the two methods yield the same results, consider the following example. Assume for some hypothetical company that is financed with 60% debt and 40% equity, that $\beta_E = 1.82$, $B_D = 0.45$, $r_f = 5.0\%$ and $r_M - r_f = 8.5\%$. Method 1 is the procedure adopted by Brattle. Method 2 is the procedure adopted by Dr. Vander Weide.

Method 1: Calculate the overall cost of capital directly from the cost of equity and the cost of debt at the observed capital structures. Equations (1) and (3) imply that

$$r_E = 20.5 = 5.0 + (1.82)(8.5) \quad (7)$$

and

$$r_D = 8.8 = 5.0 + (0.45)(8.5) \quad (8)$$

[44] Vander Weide Affidavit at ¶ 16.

The all-equity or overall cost of capital is 13.5% = (.4)(20.5%) + (.6)(8.8%). Since the overall cost of capital is independent of capital structure in this method, the overall cost of capital at 50 percent debt and 50 percent equity is also 13.5 percent.

Method 2: Calculate the new equity beta at the 50/50 capital structure. Calculate the cost of equity at the 50/50 capital structure using the adjusted beta. Calculate the overall cost of capital at a 50/50 capital structure using the cost of equity estimated at a 50/50 capital structure and the cost of debt. For purposes of this exercise we will assume the cost of debt and hence the beta of debt do not change as we move from one capital structure to the next. However, the results hold even if the cost of debt and thus, the beta of debt, change.

We will rely on the following two formulas for these calculations. Equation (9) is the relationship between the asset beta, β_A and the debt and equity betas. D is the market value of debt, E is the market value of equity and V is the market value of the company and is equal to D + E.

$$\beta_A = \beta_D \left(\frac{D}{V}\right) + \beta_E \left(\frac{E}{V}\right) \tag{9}$$

Equation (10) is the formula for calculating the relevered equity beta. Relevered equity betas, β_E^L, are derived by first unlevering the equity beta estimated at the current capital structure, β_E, to get the asset beta, β_A; then relevering the asset beta at the hypothetical capital structure. Asset betas reflect the risk of assets and operations, exclusive of the financial risk brought about by leverage.

$$\beta_E^L = \beta_A \left(1 + \frac{\hat{D}}{E}\right) - \hat{\beta}_D \frac{\hat{D}}{E} \tag{10}$$

First, we calculate the asset beta using Equation (9).

$$\beta_A = 1.0 = (.45)(.6) + (1.82)(.4) \quad (11)$$

Next, we calculate the relevered equity beta at the 50/50 capital structure. Using equation (10) and the asset beta obtained in Equation (11) we have:

$$\beta_E^L = 1.55 = 1.0(1+1) - (.45)(1) \quad (12)$$

Next we calculate the cost of equity at the 50/50 capital structure using the relevered equity beta in Equation (12).

$$\hat{r}_E = 18.18 = 5.0 + (1.55)(8.5) \quad (13)$$

Finally, since the debt beta has not changed, it follows from Equation (8) that the cost of debt is still 8.8%. Thus, the overall cost of capital at a hypothetical 50/50 capital structure is 13.5% = (.5)(18.18%) + (.5)(8.8%).

It is clear that both methods yield the same answers. Thus, both methods rely on the simplifying assumption that the overall cost of capital is constant.[45]

Finally, we note that, in addition to contradicting himself, Dr. Vander Weide failed to offer an alternative relationship between the capital structure and the overall cost of capital to that employed by Brattle.

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[45] This conclusion is also documented in Brealey and Myers, *op. cit.* at Chapter 9.

E. Risk-Free Rate

1. Dr. Vander Weide's Recommendation to Use the Contemporaneous Yield as an Estimate of the Expected Yield on One-Month Treasuries is Unreasonable

Dr. Vander Weide claims at paragraph 8 of his affidavit that Brattle should have used the contemporaneous yield on one-month Treasury bills as the estimate of the expected return on one-month Treasuries. Brattle used the forward looking one-month Treasury bill rate embedded in longer-term Treasury rates. At footnote 2, page 5, of his affidavit, Dr. Vander Weide states, "The current yield on Treasury bills is the best estimate of the return current Treasury bill investors can expect to receive on their investment. Since interest rates fluctuate without a pattern, the current yield on Treasury bills is also the best forecast of the future yield on Treasury bills."

The contemporaneous yield on one-month Treasuries is not indicative of the expected yield on one-month Treasuries for the period over which the rates which are the subject of these hearings are going to be in effect, *i.e.* the next two years. Contrary to what Dr. Vander Weide believes, interest rates can fluctuate *with* a pattern. For example, the current trend in interest rates is upward. Given such a trend, does Dr. Vander Weide still believe that investors would not adjust their expectation of one-month Treasury bills up accordingly?

Moreover, if one is to choose the contemporaneous yield as the expected yield on one-month Treasuries, at what point in time do you choose the rate? The average yield on one-month Treasuries for the first week in September 1993, the time of the responses to the first NOPR, was 2.90 percent. The average yield on one-month Treasuries for the last week of June 1994, the time of the responses to the Cost-of-Service Order was 3.64 percent. The average yield on one-month Treasuries for the last week of November 1994 was 4.50 percent. The contemporaneous yield is marching up and at each period would be an understatement of the risk-free rate in the future.